

# AVIATION

*The Oldest American Aeronautical Magazine*

DECEMBER, 1933

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## AVIATION

FOR DECEMBER, 1933

The rapidly rising tonnage of air express has been due in a large part to co-operation among the airlines in such matters as tariffs, transfers of shipments, and routing. The article herewith presented, while based on the past year's record of one of the interstate systems, furnishes a representative picture of the progress during the year and of the important trends in traffic and in the application of air express to the solution of the problems of many businesses.

## Air Express Experiences

By T. Park Hay

First Chairman, General Air Express  
Public Relations Director, Transcontinental & Western Air, Inc.

PROGRESS toward the solution of the problems of air express has been accelerated through co-operation among the transport lines, and simplification of shipments among member lines within the groups operating in the field has gone far to provide natural distribution for merchandise moving by air. By giving first consideration to the interests of the shipper and to the conditions that justify the use of air transport in the moving of merchandise, it has been possible for air line groups to coordinate their services and the result has been a year of unprecedented growth for the express business.

Three steps are necessary in the formation of an interstate system such as General Air Express, which came into being Aug. 3, 1932, as an informal unincorporated association of seven air lines:

1. Publication of a joint air express tariff to include through rates between all points served by member lines.
2. Perfection of a shipping document

or a warrant to permit the free flow of traffic over the entire group.

3. To construct an insurance underwriter that the combined services of the airlines may be regarded as one operation as far as express is concerned, and obtain insurance covering the liability of the companies at a standard rate with the same simplicity as though a contract had been made with an individual line.

### Consider the shipper

The greatest difficulty in a co-operative scheme of this character is the determination of a policy to control aptly the routing of traffic, meet the natural desires of each member line as for long-haul movement. This problem has been kept under control from the beginning through the adoption of a routing policy made in the interests of the shipping public, viz.: that the routing be done in the manner which provided the earliest delivery to destination with the minimum number of transfers.

General Air Express is not in any way a pool arrangement. Each individual member line collects from each load a rate which approximates 8 cents per mile per 100 lb. (80 cents per ton-mile). There have been, up to the present time, no rate agreements made among any of the lines in the group and the through rate structure contained in the Interline Tariff is made up by combining the rates in force on each one of the individual airlines. In the case of interstate shipments moving over several different airlines to a common point, revenues are divided among the lines on the basis of percentage of the total mileage flown by each of the companies involved.

Supervision is maintained by the Interstate Express Committee, composed of a representative of each member line, and meeting the office of chairman once a year, with the president of S. F. Christy, general secretary. So far, there has not arisen within the group any serious problem which has in any way approached a breach.

Air Express is considered to be in the very earliest stages of infancy and landed and number of shipments handled are not particularly representative when we think of them in terms of a national shipment agency. We must bear in mind, however, that this business has been developed against the backdrop of rates which range from five to six times greater than those for rail express and that the carrying capacity of the planes devoted to express traffic has been limited on many of the routes. Air Express still is regarded by transport agencies as supplementary service.

In early stages it hardly seems more revenue than that derived from express baggage. Today, however, it produces from one to fifteen times the revenue obtained from transporting passengers' baggage, netting more than the free weight limit.

Express traffic has enjoyed a greater percentage of growth during the past year than any other division of the air transport industry or of the transport industry as a whole. During the first twelve months, the group handled 40,030 shipments which weighed a total of 425,140 lb. (This figure eliminates shipments in morning shipments passing over more than one line.) If we compare August, 1953, with the same period last year, we find that shipments increased 153 per cent and the payload 189 per cent.

Since General Air Express, in its first year of operation, transported 851 per cent of the mail air express business at the country, the study of rates based on the records of the transportation can be assumed to be representative.

An analysis of the total number of shipments originated from August, 1952, to September, 1953 (Fig. 1), shows a very substantial growth. At the end of the first month only 2,800 shipments were handled. After the seventh month of operation the number rose to 4,400 shipments and in September of the present year the monthly peak of 5,533 shipments was reached and the trend factor has been upward. While the number of shipments handled by individual lines vary from



Fig. 1: An increase in short-haul business is reflected in the monthly study of average shipment received per shipment.

month to month the variation is similar for the three principal member lines and a relatively even course with some peaks and recessions has prevailed. The sharp rise in March, 1953, can be attributed to the Black Friday when New York was launching currency for the nation. During this period Federal Reserve notes entering foreign ports were shipped by air express and telegraph companies forwarded to their agents in outlying cities, quantities of cash sufficient to meet their estimated demands. This cash can be defined also by the definite peak in the charts showing average weight and average revenue (Figs. 3 and 4).

#### Long haul or short?

A study of the average distance (Fig. 2) which these shipments traveled is interesting. The average length of haul for this system during the year was 791 miles. Some of the lines, however, have reported a substantial decline in short-haul business. While long hauls may be regarded as unprofitable, they are the most profitable. Transcontinental & Western Air derives a substantial amount of transportation at the end of the year and business in Boston, or Washington and Pittsburgh, getting approval of their close, and having the display returned the same day for many shippers.

Included in the rapidly increasing list of commodities are certain items which have become commodities. Among these are mobile picture film, instant-to-use, automobile parts, electronic, cut flowers, photo plates, mounted slides, newspaper maps, newspapers, news photos, and advertising matter. Many shippers of these commodities have been brought to a realization of the time saved by using air express in the past year. In October, 1953, the average shipment of one of the member lines weighed 19 lb. By the middle of November the figure dropped to less than 12 lb. It continued at 12 lb. through April and May and with a slight dip, rose again to 12 lb. in July. Then it dropped off to 9 lb. in August, 1953. On December 1st, 1953, it was 10 lb. The average shipment weight in 1952 was 14 lb. This category probably decreased to about 30 lb. in

January, rose to 15 lb. in April, 1953, and last reached 40 lb. on 31 lb. Eastern Air Transport has handled shipments with weight increasing from 45 lb. in October, 1952, to 9 lb. in November of the same year, contrasting between 51 to 8 lb. through April, 1953, and then leveling off to 5 lb. through August.

These variations are very largely accounted for by a very substantially increasing variety of shipments. Suchan quantity and the kind of commodities shipped could be counted on the fingers of two hands. To day, there have been more than 800 different items moved by air express. Another very plausible explanation of the drop in the average weight per shipment is the increase in short-haul business which, in the main, consists of smaller packages such as prints, business from advertising agencies, photographs, and lighter materials which are being rushed back and forth between closely situated cities in the conduct of a day's business. There are many instances as noted where advertising agencies are pre-



Fig. 2: The Black Friday peak is also reflected in the monthly rates of average distance traveled. The trend during the year has been downward.

paring copy and displays, cutting them into small sections, and sending them to Boston, or Washington and Pittsburgh, getting approval of their close, and having the display returned the same day for many shippers.

Included in the rapidly increasing list of commodities are certain items which have become commodities. Among these are mobile picture film, instant-to-use, automobile parts, electronic, cut flowers, photo plates, mounted slides, newspaper maps, newspapers, news photos, and advertising matter. Many shippers of these commodities have been brought to a realization of the time saved by using air express in the past year. In October, 1953, the average shipment of one of the member lines weighed 19 lb. By the middle of November the figure dropped to less than 12 lb. It continued at 12 lb. through April and May and with a slight dip, rose again to 12 lb. in July. Then it dropped off to 9 lb. in August, 1953. On December 1st, 1953, it was 10 lb. The average shipment weight in 1952 was 14 lb. This category probably decreased to about 30 lb. in

Among the daily shippers of automobile parts are General Motors and Chrysler who refuse an express to provide faster service for repair work and, at the same time, reduce the inventories at their distributors. Three manufacturers are willing to pay a premium to get samples in the hands of their salesmen a few days ahead of their competitors. A New York shipper from his discovery that his clients could be distributed through the Middle West from Cincinnati has expensively tried from New York and has for the time being bridged the gap. Cut flowers, sea food, and other perishables have found new and extended markets through air express.

Nearly 90 per cent of the shippers were small trade users. The large shippers, constituting the remaining 10 per cent, were divided almost evenly as to irregular and regularity. This indicates that the bulk of shipments comes from a very widespread group, providing a broad base on which to build traffic. Of the total credit almost 70 per cent is provided by large and regular shippers, the remainder coming from comparative infrequent users.

Nearly 90 per cent of the year's business came from the motor package and printing and publishing industries, the latter accounting largely for the June peak in shipments originated. 80 per cent came from the textile and apparel industries where manufacturers include many airplane manufacturing concerns.

The average revenue per shipment for the system during the year, is \$3.97. A peak was reached during the first month of operation when it was nearly \$5, and it has gradually fallen off by reason of the large increase in the number of shipments. In August of the present year, however, the average revenue advanced (Fig. 4).

The peak of the first month of operation was due to the fact that the first month of operation was made up of long-haul experimental shipments that characterize the initial traffic of new express groups.

#### Building business

New York City from the beginning has inherited the greatest proportion of



The New York office staff of General Air Express. Left to right: William, Richard, Herbert, M. M. Miller, Kenneth C. M. Miller, M. M. Miller, M. M. Miller, M. M. Miller.

gross revenue, the business originated here having maintained an average of 26 per cent of the total. This has been made possible, in a large measure, by the fact that in New York the initial attempt to interest the public in the use of air express service has been made by creation of a commission sales force which was established about a year ago. Seven men are now devoting their entire time to selling the air shipping idea in Greater New York working on a commission basis. The sales have been divided off into districts and each man is given credit for every pound which originates in his district. The group is headed by Mel J. G. Brown, sales manager. After months of concentrated effort and much foot work, some of the men have developed their territories to a point of popularity to which they point with pride.

In selling the new type of distribution service to the New York shippers, salesmen use a double tactic. Besides the traffic manager of various present companies, the sales department is also directed. The sales manager is responsible for the delivery of the new high-speed equipment which will be accompanied by an increase in the number of shipments. This will not only provide much quicker delivery but will overnight instant-to-use delivery service on the mid-transcontinental route. For this reason the salesmen will provide more cars space for air express. It is believed that this acceleration of the air shipping movement is general. By the end of 1954, when a demand in several sections of the country for a specialized service carrying express mail express only.

#### Pick up and delivery

One of the outstanding differences in the one courier air express groups is in their pick-up and delivery service. The Railway Express Agency uses its established ground facilities while General Air Express, on the other hand, works with Postal Telegraph, has demonstrated the adaptability of messenger service delivery for this type of merchandise. The comparatively light weight shipments are more suitable for a messenger

boy to handle. It has been found that the association of rapidly of telegrams and the handling of air express shipments by a telegraph messenger has had a favorable psychological effect on the shipping public demanding speed. No weight limit is placed on shipments and parcels weighing from 100 to 500 lb. are frequently carried. In addition of the larger office, a special air express motor truck operates between the airport and the downtown collection point where the shipments are divided into routes and dispatched quickly by messenger boys using local transportation.

The telegraph company has also found itself in a position to assist materially in merchandise in the air shipping idea. Station callings attention to high-speed delivery service of air express have been placed on millions of telegrams calling the service to the attention of a potential shipper the moment an answer is sent in.

#### What the future holds

It is expected that the year 1954 will show a very substantial increase in air express shipping due to the advent of the new high-speed equipment which will be accompanied by an increase in the number of shipments. This will not only provide much quicker delivery but will overnight instant-to-use delivery service on the mid-transcontinental route. For this reason the salesmen will provide more cars space for air express. It is believed that this acceleration of the air shipping movement is general. By the end of 1954, when a demand in several sections of the country for a specialized service carrying express mail express only.

Several transport operators are already giving serious consideration to widening area of the plants which will be equipped with air express and faster service as firms are pressed to operate between present shipping centers where deliveries can be made overnight without loss of any business time.



Fig. 3: Monthly variation of the total number of shipments originated shows a substantial increase during the year. The Black Friday peak in the charts can be defined also by the definite peak in the charts showing average weight and average revenue (Figs. 3 and 4).

In the preceding articles of this series (of which this is the third and concluding installment), Mr. Huntington, recognizing a need for greater standardization in airplane design, framed up, as a point of departure, a general specification into which the fabric of the airplane of the future might be hung. In this article the author proposes his own answer to the questions he has raised.

## Search for an Ideal

PART III

By Dwight Huntington

ILLUSTRATIONS BY THE AUTHOR

ONE might logically distrust the opinion one, after having made his analysis and diagnosis, feels to push his plans for the way toward a rational conclusion. In view of the analysis, however, to build up, on the basis of the specifications and limitations which we have imposed, some concrete suggestions as to the probable line, shape, and general appearance of the airplane to be developed for the present owner of the future. In terms with, we will make our basic assumptions from the analysis (AVIATION, November, 1931, page 349)—our machine will be an amphibian of the long haul type.

First the basic consideration to design in the relationship between the passenger section of the body and the power plant, or, more definitely, between passenger, engine, and propeller—the form and location of wing, undercarriage, empennage, tail, and the engine location may be laid aside temporarily. Let us therefore consider briefly the relative merits of several of the many half-powerplant combinations that have been previously and others suggested by contemporary writers that have gone before.

Viewing tractor propeller installations first, Fig. 1 is a modification of the Kermanshah Air Yacht, with a central Vee engine, and later equipped with an inverted radial type. The central engine certainly offered advantages in depressed resistance and increased visibility, as opposed to the lower powerplant position and associated powerplant refractivity of the latter air-cooled machine.

Fig. 2 was suggested by an old French form laid plans for a machine which used an end cylinder heads (inward), the propeller shaft at right angles to the crankshaft. Here it is an

ideal installation for cooling as the engine since the propeller blast is directed upon the cylinder heads.

Fig. 3 represents the conventional high axle engine installation. It is one of the Euxine Air Yacht, Kermanshah-Looming, and similar designs. The detached nacelle obviously affords the designer a wide range in the choice of engine type.

Fig. 4 shows tandem overhead engine installation and was suggested by an Austrian French land type monoplane produced in 1914, which utilized an airframe, water-cooled engine. In Fig. 5, a horizontally-disposed engine has been suggested. Such designs encourage the use of windshields set in the best angle for vision forward and downward.

Summarizing, we may conclude that Fig. 1 is superior to Figs. 3, 4, and 5 in several particulars, notably the smaller frontal area of the half-engine combination, due to a decrease in the depth of the hull and the absence of a nacelle; a lower C.G., requiring less flotation forward and afloat, due to decreased pitching and rolling moments; better visibility forward; increased engine accessibility; and more pleasing lines. Fig. 2 indicates quite clearly, therefore, several of the many advantages made possible by remote drive powerplants as compared with the direct drive type.

### Pusher installations

Glancing at pusher installations it is at once apparent that in Figs. 3, 4, and 5 is capable of a pusher adaptation, by means of a long drive shaft extending across the top deck to the propeller.

Fig. 6 was suggested by the Wright first form of pre-war design, in which a single-shaft engine drives into pusher screws by means of shafting, chains and sprockets. Although shafting and gears to a single screw are here suggested,

powerplant reliability seriously is depressed somewhat by the rubber elbow drive required to attain the roof engine and propeller locations shown.

Fig. 7 gives a strong resemblance to the Looming Air Yacht of 1919 and similar subsequent designs. In the former a Liberty V-12 upright engine was used, in place of the inverted V-ee engine illustrated which permits of a slightly lower C.G. and increased visibility shaft.

Fig. 8 follows the general laid plan of the original Looming design of 1911. It affords an excellent compromise between the installations of Figs. 6 and 7.

Realizing that Greater C. Looming was chief engineer of the Wright company at the time the ship referred to in Fig. 8 was developed, and that Figs. 3, 4, and 7 also are reminiscent of his designs, one may safely conclude that whenever form a small amphibian essentially swimmers, it will bear the unmistakable imprint of his pioneering work.

Fig. 9 is similar to Fig. 8 except that the engine has been converted, according to Pictet, in order to replace the champagne-glass drive with a straight, more compact, and more reliable shaft-and-gear drive. Longitudinal belt space is conserved by this arrangement also

powerplant reliability seriously is depressed somewhat by the rubber elbow drive required to attain the roof engine and propeller locations shown.

Comparing power designs it is readily apparent that Figs. 6, 8, and 9 are superior to Figs. 3, 4, and 5 with chains to pusher propellers, and to Fig. 7, in such important matters as decreased frontal area, a lower C.G. and decreased pitching and rolling moments; increased visibility and engine accessibility. Figs. 3, 4, and 5 therefore may be omitted from further discussion.

Before discussing Fig. 7 let us compare this installation with that of Fig. 9. The former will deliver proportionately more power in the propeller, the latter permits of more efficient engine and propeller speeds and offers a saving in resistance and to propeller power required. Similarly, although Fig. 7 entails an additional weight in drive mechanism, Fig. 9 permits of a nacelle saving in engine support weight.

In this connection it is well to bear in mind that a potential purchaser can visualize the inherent threat of a dangerous point engine far more readily than he can follow through the structure provided to carry the engine load across the passenger section in the event of a crash. From the psychological viewpoint at least, a good design tends to follow with reference to engine installation in single-engine ships for

land use, would be to keep the engine out of the upper rear quadrant, assuming the foremost occupant's eye as the design point.

Fig. 7 with its direct drive assembly appears to be the more reliable installation, yet when one considers the great extent to which reliability of remote drive mechanisms has been developed in other forms, particularly in automobiles, there is apt to be less hesitancy regarding the present re-adoption of the idea by airplane manufacturers. The original Wright of 1903, it will be recalled, employed remote drive.

Fig. 9 also offers considerable advantages over the installation of Fig. 8. It decreases the length of hull required, with a consequent saving in weight; permits of placing the pilot well in front of the wings and of building the variable length tower the C.G.; the propeller drive is simpler and of less weight, the engine is in a more accessible location; the fuel tank is decreased, and engine hoses are more easily diverted from the occupants.

Making another important assumption in this point—that the simplicity and reliability of the no-ended engine assumes its continued dominance in small private planes, we may conclude that

the Fig. 9 installation also affords an excellent compromise over Fig. 6 and 8.

The installation shown distinctly looks a Vee type engine, which works so admirably with the Vee taper of the hull at this point. Sucking the air directly onto the cylinder heads and into the cylinder stays, and expelling it instantaneously across the cylinder through large leaves in the outer cowling, should provide an ideal cooling situation, assuming that conventional, however, circular cooling fans are used. The conventional cylinder design such as the old-style Pictet and the older Gyronnet, with radially disposed, conical fins and tube respectively, has also decreased of further consideration in connection with the engine installation of Fig. 9. At a matter of fact, instead of exposed nacelle may be used if desired.

### Tractor and pusher

Comparing finally the best tractor and pusher installations (Figs. 2 and 9 respectively) reveals that the latter includes many points of superiority over the former, notwithstanding the high center low; better observation of balance; the variable load being nearer the C.G.; improved vision; the pilot being well



Fig. 1



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7



Fig. 8



Fig. 9



Fig. 10



Fig. 11



Fig. 12



Fig. 13



Fig. 14



Fig. 15



Fig. 16





is bringing to a conclusion his interesting series of articles on Italian military aviation. *Comandante Scaroni* traces the development of pursuit and training types. His long and intimate connection with Italian military aviation, including wartime service as a pursuit pilot, several years in the United States as Air Attache of the Italian Embassy, and active command of field and base units, have furnished an unusually good background against which to sketch the current status of Italy's air forces for American readers.

## The Equipment of Air Forces

ITALY (PART III) PURSUIT AND TRAINING

By *Comdr. Silvio Scaroni*

IN THE FIELD of bombing and observation there are indications that theory and practice are tending to move closer and closer together. Once the specific requirements have been clearly stated, it is relatively easy to produce machines to fulfill them. Experts are pretty generally in agreement as to the function of bombers and observation planes in future wars, but the manner of employment of the engine-fighter is still a moot question.

Of course, a very broad specification is easily written. A single-seat fighter must have the highest possible speed in flight and in climb, it must provide the least possible radius for the pilot, his maneuverability must be unquestioned at all flight speeds, and it is desirable to have the largest possible range of action. Trade-offs develop, however, when an attempt is made to properly proportion these general and somewhat conflicting characteristics. In final analysis, the proportion of each of the desirable properties depends on the stage to be made of the airplane, and it is on this fundamental point that experts all over the world hold widely divergent opinions, as witness the pressure of types now in existence. But C. G. Grey writes in this department that "The Royal Air Force possesses by far the

best single-seat fighter in the world."

Some of Mr. Grey's contemporaries in other countries have been known to take issue with him on this point; for they hold their own theories of just at high regard. It is not my intention to enter into the argument as to the superiority of one nation's fighters over another. Each has faced the problem from a different angle and naturally has obtained different results. English tactics revolve about the defense of London, a problem which requires a highly specialized type of aircraft. The American specifications are radically different and, obviously, the solution adopted could not be the same. Italy's problem concerns the defense of her most important cultural centers which are many miles apart located close to frontiers. Where *Italia's* industries are concentrated in a few squares of area, however, Italy's are spread out along a line of hundreds of miles. In this respect our problem is much more similar to that of the United States than of England and America, our single-seat fighters have grown to resemble American types much more than they do British interception class.

Our doctrine in which we are deeply interested is the attainment of high al-

titude and, to promote research in this direction, General Balbo has been developing at Montecasa a special research laboratory for studying the behavior of aircraft engines in the stratosphere.

### Pursuit History

Turning back the pages of history, it will be recalled from a previous chapter, that the development of Italian pursuit planes lagged the leader by more than three years and the reconnaissance plane by approximately one year. In 1918 Ambrosio of Rome produced the first Italian pursuit, designed strictly as the A.7 but popularly as the Balilla. The performance of this machine compared very favorably with that of the SPAD.XI supplied to Italy by France during the last part of the War. The airplane arrived, however, before the Balilla was produced in large numbers [for an interesting account of Balilla in an earlier series, read "Wings Over Poland," by Kenneth M. Murray, reprinted in *Aviation*, December, 1932].

A contemporary of the Balilla was the S.38, designed by Marchetti and built by Savoia-Marchetti. This machine was a single-seat single-bay biplane with the fuselage long midway between the sugar and lower wings



A record of flight—The C.R. 30, written by Fiat, became known to the British as the C.R.30. After the treaty of St. Germain, it was modified and licensed to the English company which developed it into a single-engine aircraft. After the C.R.30 of 1933, it was modified and licensed to the English company which developed it into a single-engine aircraft. After the C.R.30 of 1933, it was modified and licensed to the English company which developed it into a single-engine aircraft.



C.R. 30 is a close to the C.R. 30, which was developed by the English company which developed it into a single-engine aircraft. After the C.R.30 of 1933, it was modified and licensed to the English company which developed it into a single-engine aircraft.

(somewhat similar to the wartime Bess not fighter). It was powered with a 220-hp. SPA engine. With the adoption of the Balilla for service operations, however, the S.38 disappeared from the picture. In the period of political disorder which immediately followed the War no further designs were produced and the Balilla remained the only single-seat fighter in service until 1922 when it was replaced by the Fiat C.R.L.

Designed by Borelli (engineer at the R. A. bombing plane), the machine was a single biplane with twisted upper wing. In construction it was conventional for the period, except that the engine mount was made of steel instead of the wood used. Later (1925) after Fiat had developed a new 12-cylinder water-cooled engine (the A.24, 400 hp., at 2,000 r.p.m.), Borelli designed another single seater for the Air Force, the C.R.20. A biplane like its predecessor, it differed markedly in detail, the entire framing of the fuselage and wings being constructed of steel. The performance was greatly improved over the earlier design. The maneuverability was very good and the machine was strong enough to withstand all types of landing maneuvers as well as sustained dives at full throttle.

The greater part of Italian fighters used today are equipped with the C.R.30 although since 1925 many substantial improvements have been made. A great deal of attention has been given to matters concerning the strength of the fuselage especially for flights at high altitudes. The undercarriage has been modified so that it is now of the open

type with air-brake shock struts. Some of the latest machines are fitted with a new Iotta Franchi V-type six-cylinder engine, the Auto Clanca of 444-hp., which are equipped with the A.30 Fiat engine which has a unusually high compression ratio and which runs on a fuel consisting of a mixture of gasoline, alcohol, and benzol.

### A new fighter

In 1931 appeared a fighter of novel type, the M.41 bi, single-seat fighter. Two fighting squadrons were equipped with these machines at that time. They are still in service. Naturally, the present course compares with a land fighter but it has been found very useful for certain cases in the naval field. It was designed by Castaldi, who built the plane which won the Schneider cup at Norfolk, Va. in 1928. It is a

biplane of very clean line, fitted with a 400-hp. water-cooled Fiat engine mounted in a pusher. With this arrangement it is necessary to enter the additional weight of gun synchronizing gear, as the forward field of fire is not obtained by the propeller. As indicated by the cable, the M.41 bi runs well up among the land type for speed and carrying capacity and exceeds in general comparison by one full hour in flight duration.

By 1931 progress in the design of bomber and reconnaissance types had reached a point where their speeds were equal to or better than the best pursuit of the late 1920s, and it was obvious that the fighting class must be pushed to higher speeds if their effectiveness was to be retained. In 1932 Fiat introduced the C.R.30, another Borelli design to meet the new requirements



Worked forward. After the Balilla, the M.41 bi, which was an improvement over the C.R.30, and which won the Schneider Trophy in 1928, was the first Italian fighter to be built in 1931. After the M.41 bi, which was an improvement over the C.R.30, and which won the Schneider Trophy in 1928, was the first Italian fighter to be built in 1931.

At a single step two speeds were pushed from 800 m.p.h. to 220 m.p.h. The general level of the C.R. series was reasoned but an electric construction was adopted. The power plant is a geared six normally developing well over 600 hp at 2,600 r.p.m. of the engine shaft (2,600 r.p.m. at the propeller). The compression ratio is 8. In two banks of six cylinders are arranged in a V at an angle of 30 deg. The dry weight is 1,947 lb., including back-springing gear, and fuselage (wing) inlet vision in the C.R.30 is very

good, and, although its speed has been tremendously increased, its maneuverability has not been greatly reduced. With its streamlined arrangement, speed, and maneuverability, the C.R.30 makes a formidable competitor for any military plane now in existence. Unfortunately, one of these machines won the international speed contest for military planes in Switzerland in 1932.

Affairs details are lacking at the time of this writing; it is known that British Caproni and Fiat are working on new designs in the present class

some of which may be ready for public exhibition by the end of the year.

### Trainers

Flight training in Italy dates back to 1903, when Caproni developed a monoplane school type machine. Shortly afterward Gabrielli (1904) produced a training machine on which, at his flying school at Novara, opened in 1910, he had instructed over 1,500 pilots by the end of the War. His machine but to its credit a crossing of the Alps in 1914. Since the War the latest type has

### IMPROVED FEATURES

Model	Year of construction	Engine	Power (hp)	Weight (lb.)	Speed (m.p.h.)	Altitude (ft.)	Range (mi.)	Maneuverability	Cost (\$)
Breda 13	1913	Spica A	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 15	1915	Spica B	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 17	1917	Spica C	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 19	1919	Spica D	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 21	1921	Spica E	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 23	1923	Spica F	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 25	1925	Spica G	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 27	1927	Spica H	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 29	1929	Spica I	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 31	1931	Spica J	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 33	1933	Spica K	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 35	1935	Spica L	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 37	1937	Spica M	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 39	1939	Spica N	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 41	1941	Spica O	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 43	1943	Spica P	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 45	1945	Spica Q	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 47	1947	Spica R	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 49	1949	Spica S	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 51	1951	Spica T	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 53	1953	Spica U	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 55	1955	Spica V	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 57	1957	Spica W	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 59	1959	Spica X	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 61	1961	Spica Y	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 63	1963	Spica Z	200	1,800	134	13,700	2.30	14,000/18,000	30

### TRAINING MACHINES

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Breda 31	1931	Spica J	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 33	1933	Spica K	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 35	1935	Spica L	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 37	1937	Spica M	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 39	1939	Spica N	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 41	1941	Spica O	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 43	1943	Spica P	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 45	1945	Spica Q	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 47	1947	Spica R	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 49	1949	Spica S	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 51	1951	Spica T	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 53	1953	Spica U	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 55	1955	Spica V	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 57	1957	Spica W	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 59	1959	Spica X	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 61	1961	Spica Y	200	1,800	134	13,700	2.30	14,000/18,000	30
Breda 63	1963	Spica Z	200	1,800	134	13,700	2.30	14,000/18,000	30

been converted into some eight different sub-types, the last of which was still in service in 1938.

A number of competing built primary and secondary types of machines followed the War—encompassing Caproni, Breda, Marchi, Curtiss, and others. As a result, the Italian Air Force (A.S.I.) had a number of different types of machines in its inventory. The first of these was the Breda 13, which was a simple, sturdy, and reliable machine. It was built in large numbers and was used for many years. The Breda 13 was a single-engine, open-cockpit, biplane. It had a maximum speed of 134 m.p.h. and a range of 2.30 hours. It was built in 1913 and was still in service in 1938.

In 1920 General Balbo appointed a military commission to make a thorough study of flight training methods, and to draw up a set of standard specifications for training machines. Up to this time each aviation school had been left to provide for its own needs in the way of methods and equipment. Under this system had developed a haphazard situation, in which some civilian aviation schools (all private enterprises) were using machines like 30 different types of machines for the three stages in which flying students were then divided. The first step was to evaluate the training machines then found in two parts: primary and a secondary group. This made possible the evolution of two types of machines for each of the stages.

During the decade of the commission to reduce the training to two stages considerable study was made of the problem of simplifying the flying material and reducing the cost per flying hour. It was necessary to standardize on equipment and, if possible, to obtain machines which could be easily converted from primary to secondary training equipment by simply changing such parts as wings, elevator, rudder, or engine.

This study was hampered somewhat by two different schools of thought which were in evidence at that time. One school was in favor of making it difficult to fly, in order to make it possible to eliminate unsuitable pilot material from the very beginning. The second school, which was in evidence at that time, inclined toward a machine easily flown, so that the largest possible number of pupils might be brought to the side schools. Finally, a compromise was reached somewhere between the two extremes and it has been specified that, for the primary period of instruction, the speed should be between 40 and 60 m.p.h., and for secondary types, from 55 to 100 m.p.h. Both types, however, must be capable of performing all forms of aerobically and acrobatically and must be so constructed that pilots can get clear of the cockpit easily and quickly in any tight situation.

Further details were specified. The commission favored biplanes and, from a standpoint of economy, recommended either monoplane or all wood types of construction. Ground fuel systems were to be adapted on account of simplicity and practicability. Other matters to be considered were the cost of construction and repair, simplicity of construction, and ease of assembly and disassembly.

As far as engines were concerned the Commission indicated a preference for air-cooled types. In-line or V-engine arrangements were to be preferred over the radial type, on account of their lower susceptibility to damage in nose-over landings. For primary training it was suggested that engines be of 100 hp or 1,200-1,750 r.p.m., and should weigh from 24 to 35 per horsepower. For the secondary stage, engines should develop approximately 200 hp, at 1,600-1,750 r.p.m., and should weigh 24 to 35 lb. per horsepower. In each case the gas-

line consumption should be approximately 32 lb. per hp-hr at 90 per cent of full throttle r.p.m.

### Design competition results

As a result of a design competition instigated by General Balbo, General staff against the specifications outlined above, a number of machines were prepared for both categories. One of the group in the secondary class, the Breda 25 was selected as the best. This is a biplane of composite construction fitted with a Liza engine built by Romeo at Milan. The fuselage is of welded steel tubes covered partly by duralumin and partly by doped fabric. The undercarriage has dissymmetrical shock absorbers, and the wheels are fitted with brakes. The ailerons are of fabric-covered welded steel. Both the wing and stabilizer are adjustable. The wing is joined from back spar, and both controls are clear of obstruction so that the pilot wearing a parachute may leave easily and quickly. With a safety factor of 1.5 for the entire ship, it may be safely subjected to the entire range of aerobically.

In 1920 secondary design competition was provided by General Balbo. Twenty-four machines were entered, and one was selected as a cheap means of training reserve pilots. One of the seven or eight proposed by the industry, four were selected. The Fiat A.13, the Breda 15, the Breda 17, and the CA.100. The first three were completed and the last was built. Of this group, the CA.100 and the A.13 were later selected as primary training machines, not only on account of their flying ability, but on account of their economical construction and maintenance.

The CA.100 is a rigid biplane of composite construction, fabric-covered. Section of these machines are fitted with an Isotta Fraschini engine of 80 hp, and others with the Fiat A.55, a radial engine of 90 hp. Each ship has been built in accordance with the specifications of 1919's design, respectively modified. The A.13, on the other hand, is a monoplane of composite construction and doped fabric. The fuselage being covered by plywood and the wings by doped fabric. In common with the CA.100 it has sliding wings. As details are not available, it is understood that the Breda 15, the Fiat A.13, the Romeo 15, and the CA.100 have undergone considerable improvement recently and show certain other new planes for training purposes are now under test.

The choice between the central place as far as machines are concerned. As to personnel, it might be mentioned that all pilots assigned to the various offices of the Ministry, it is to be noted, are not connected with the flying units, are formed into special squadrons and continue their flying practice on standard types of training machines modified for improved performance.



On the extreme type of machine described under name 1310 which was first devised the early War years.



Breda 15 standard secondary school machine, the Breda 15.



A group of primary training planes. Above, right: The Breda 13. Above, left: The Fiat A.13. A more modern version of the A.13. Below: The Breda 15. Below, right: The Breda 17. Below, left: The Breda 19. Below, right: The Breda 21. Below, left: The Breda 23. Below, right: The Breda 25. Below, left: The Breda 27. Below, right: The Breda 29. Below, left: The Breda 31. Below, right: The Breda 33. Below, left: The Breda 35. Below, right: The Breda 37. Below, left: The Breda 39. Below, right: The Breda 41. Below, left: The Breda 43. Below, right: The Breda 45. Below, left: The Breda 47. Below, right: The Breda 49. Below, left: The Breda 51. Below, right: The Breda 53. Below, left: The Breda 55. Below, right: The Breda 57. Below, left: The Breda 59. Below, right: The Breda 61. Below, left: The Breda 63. Below, right: The Breda 65. Below, left: The Breda 67. Below, right: The Breda 69. Below, left: The Breda 71. Below, right: The Breda 73. Below, left: The Breda 75. 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Fig. 1. A three-bladed G-2 11 ft. 8 in. propeller of Curtiss design was used in the tests on the Curtiss-Wright G-2 engine.

A comparison of flight test results with several types of controllable pitch propellers

## Pitch Control

By  
*A. E. Lombard*  
*Aerodynamic Engineer*  
IN COLLABORATION WITH

*T. P. Wright*  
*Director of Engineering*  
*Curtiss-Wright Aircraft Company*

Table 1. Performance of Curtiss-Wright G-2

The Curtiss-Wright G-2 engine was used as the original model under test and in four other tests because the latter aerodynamic experiments were being progressed by the latter test. Gross weight, 14,000 lb.; sea weight Curtiss-Wright G-2 engine 8,700 lb.; at 1,000 ft. alt. 8,600 lb.; (standard atmosphere, 11 ft. 8 in. diameter). (Pitch average used in each case are indicated in parentheses.)

Type of Propeller	Fixed Pitch	Two Positions	Four Positions	Eight Positions
1. Fixed Pitch				
Installed at 10,000 ft.	175	175 1/2	176 1/2	177
5,000 ft. (p. 1)	175	176 1/2	177 1/2	178
10,000 ft. (p. 2)	175	176 1/2	177 1/2	178
10,000 ft. (p. 3)	175	176 1/2	177 1/2	178
2. Variable Pitch				
Installed at 10,000 ft.	175	176 1/2	177 1/2	178
5,000 ft. (p. 1)	175	176 1/2	177 1/2	178
10,000 ft. (p. 2)	175	176 1/2	177 1/2	178
10,000 ft. (p. 3)	175	176 1/2	177 1/2	178
3. Variable Pitch				
Installed at 10,000 ft.	175	176 1/2	177 1/2	178
5,000 ft. (p. 1)	175	176 1/2	177 1/2	178
10,000 ft. (p. 2)	175	176 1/2	177 1/2	178
10,000 ft. (p. 3)	175	176 1/2	177 1/2	178
4. Variable Pitch				
Installed at 10,000 ft.	175	176 1/2	177 1/2	178
5,000 ft. (p. 1)	175	176 1/2	177 1/2	178
10,000 ft. (p. 2)	175	176 1/2	177 1/2	178
10,000 ft. (p. 3)	175	176 1/2	177 1/2	178
5. Variable Pitch				
Installed at 10,000 ft.	175	176 1/2	177 1/2	178
5,000 ft. (p. 1)	175	176 1/2	177 1/2	178
10,000 ft. (p. 2)	175	176 1/2	177 1/2	178
10,000 ft. (p. 3)	175	176 1/2	177 1/2	178
6. Variable Pitch				
Installed at 10,000 ft.	175	176 1/2	177 1/2	178
5,000 ft. (p. 1)	175	176 1/2	177 1/2	178
10,000 ft. (p. 2)	175	176 1/2	177 1/2	178
10,000 ft. (p. 3)	175	176 1/2	177 1/2	178

Eight positions used and conditions determined from

Fixed Pitch 175 ft. alt. at 1,000 ft. (level flight)

Two Positions 175 ft. alt. at 1,000 ft. (level flight)

Four Positions 175 ft. alt. at 1,000 ft. (level flight)

Eight Positions 175 ft. alt. at 1,000 ft. (level flight)

Eight Positions 175 ft. alt. at 1,000 ft. (level flight)

All angles available for maximum performance. Data available (indicated) at 10 ft. alt. during steady climb rate. Fixed 11 ft. 8 in. (standard) at 10 ft. alt. during steady climb



Fig. 2. Altitude characteristics of the Curtiss-Wright G-2 engine. The engine speed is 1,750 r.p.m. and the propeller is of the standard type and engine speed used and standard 1,750 r.p.m.



Fig. 3. The installation of the Curtiss-Wright engine in a standard aircraft.

The most extended series of tests was made on the Curtiss-Wright G-2 engine, as indicated by the Flight Test Section of the Curtiss-Wright Aircraft Company, St. Louis, Mo., with several types of engines and propellers, including a Curtiss-Wright G-2 engine, as standard in Fig. 2. In order to give the performance in the engine test, the engine was installed in a standard aircraft, as shown in Fig. 3. The engine was installed in a standard aircraft, as shown in Fig. 3. The engine was installed in a standard aircraft, as shown in Fig. 3.

Flight tests and experimental calculations have brought and several other advantages of controllable pitch propellers, such as the multi-position type, in their improvement of high speed at altitude and cruising speed with unpowered engines on altitude. The results of the flight tests of several airplanes with Curtiss-Wright controllable pitch propellers are analyzed here to show what improvement can be expected

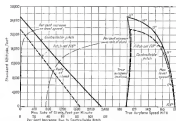


Fig. 4. Comparison performance of Curtiss-Wright G-2 propeller on the P-40C engine (10,000 ft. alt.). A test made at 1,000 ft. alt. on a Curtiss-Wright engine, developing 450 hp. at 1,000 r.p.m., sea level.

apply especially to the standard Curtiss-Wright engine as shown in Table 1.

Most of the data tabulated in Table 1 speak for themselves, but "cranking" always requires definition. In this case the cranking condition is taken as based both by power and by rpm, the former being held to a maximum of 480 hp. or less, while the latter is held to 1,750 rpm. Thus at low altitudes the cranking condition is determined by the limit on engine output, while at high altitudes (the critical point of change depending on the type and pitch of the propeller) engine speed replaces power as the limiting factor.

### Fixed-pitch propellers

At fixed pitch, the propeller had to be set at 24 deg. to obtain the 720 hp. at 1,000 r.p.m. sea level figure at 1,000 ft. The engine speed falls off in thin throttle level flight at higher altitudes so that, at 10,000 ft., it will be only 1,250 r.p.m. This results in a corresponding loss of both speed and altitude. The critical point for cranking, where engine speed is just sufficient to maintain the 720 hp. at 1,000 ft. is shown at altitudes above 2,400 ft., the power absorbed by the fixed pitch propeller at 1,250 r.p.m. is directly proportional to the relative air density and follows the curve as shown in Fig. 2.

### Two-position propellers

Two blade angle of the two-position type of controllable pitch propeller is pitched to favor low-speed flight, the other to favor high speed. In the low speed condition encountered in these tests, it would have been desirable to have the engine turn 1,850 r.p.m. at 1,750 ft. alt. at the following engine speed:

65 mph. at an level for best take-off, 96 m.p.h. at 5,000 ft. for single-engine flight.

With only one pitch to give rise of these three conditions, the 24 deg. setting, which corresponds with the single-engine condition, is chosen as the best condition. The high pitch is set at 30 deg., as in the fixed-pitch propeller, the full-throttle level flight at 1,000 ft. The high speed and cranking speed will then be identical with those of the fixed-pitch propeller. Higher cranking speeds at high altitudes can be obtained by increasing the high pitch-angle as will be shown below, but this practice is not altogether desirable with two-position propellers because of the loss of speed and cranking speed at low altitudes.

### Four-position propellers

A four-position type would give two blade angles for the low speed conditions and two angles for the high speed conditions. Since take off and cruise engine pitch are considered most important of the low speed conditions, the four blade angle setting is pitched at 22 1/2 deg. to give full power at 45 m.p.h. low take-off. The second is selected at 31 deg. to provide full power at 56 m.p.h. for cruise engine pitch. The 30 deg. angle of the fixed-pitch propeller is the third position intended to take care of high speed and cranking operation at low altitudes, and the fourth position, reserved for cranking at 10,000 ft. is 34 1/2 deg. to absorb 580 hp. at 1,275 r.p.m. The recommended cranking condition at 10,000 ft., with fixed pitch propeller, was stated previously to 480 hp. at 1,275 r.p.m. Since having war and



Extreme care must be used in interpreting the results of the market survey. We assume that the Department of Commerce will use such care as its own interpretation, but there is always danger that where simple figures are given they may be misinterpreted or misapplied by those who get hold of them without the interpretation or who elect to pay no attention to the restrictions and explanations with which they are accompanied. The total number of replies to a questionnaire is usually a small fraction of the number that receive it, and those replies are not always a fair sampling out of the whole number. The enthusiasm about a subject are most likely to take the trouble to express themselves. Furthermore, a mere declaration of willingness to buy, unaccompanied by any explanation of the conditions under which a plane would actually be used or any guarantee of good faith in the matter, must be subject to a certain percentage of discount. There are plenty of people who will gladly write "Yes" on a piece of paper, but who will not be nearly so ready to write their names at the bottom of checks for \$700 each. Analysis of the returns, and personal examination of a few sample ones, can go far to determine what the percentage of discount should be. All that must and usually will be taken into account as the Department prepares to make their interpretations.

That there is another point. We believe that 10,000 airplanes of excellent quality could be built for \$700 apiece by a single manufacturer who received a single order for the 10,000 machines. They cannot be built for any such price under the conditions that existed in 1932, with about 300 manufacturers scrambling over each other after every individual sale and with no single factory getting up to a production of more than a few hundred ships. Since the objection to enforced monopoly in this field are manifest, and since there is no way to get the benefit of mass production on airplanes without actually producing a large number of a single type, an essential condition precedent to the successful accomplishment of the Vidal plan is that the aircraft industry should cooperate as an industry has ever cooperated before. The airplane of 10,000 are to be built at a \$700 price would have to be designed as the Liberty engine was designed during the War, to represent the experience and the best thoughts of a group coming from many sources. It would have to be turned out in many plants, perhaps with wings built at A and landing gear at B and assembly takes care of at C and D, and thus it will have to be the subject of a concentrated sales campaign in which all effort is merged to get so many people as possible into the air. We don't know that that can be done. There are obvious obstacles of the gravest order. We do know that something very much like it would have to be done to make good on the Vidal plan, and that is one of several matters upon which the aircraft industry should reflect, meditate, and ponder as this inquiry into willingness to buy progresses.

## For want of a horseshoe nail

THE phenomenal growth of American airlines during the past few years is a matter of record. We start with pride in recording totals in passenger-miles flown and in tons of goods carried. Locomotives, airplanes, intricate communication networks and strategically located shops and offices for maintenance and repair have witnessed the courage and foresight and persistent effort that have built up a new transportation system through years of unparalleled business depression. The technique of airline operations is now reasonably well understood, and matters which were formerly in highly experimental categories have settled down to routine. With this much accomplished, it is time to pause for a little sobering self-examination lest any tendency develop to rest on our laurels. It would almost certainly be fatal to the entire progress of development if mistakes were permitted to compound carelessness through even the slightest degree of reduction of watchfulness anywhere along the line. Routine cannot replace individual strictness and a highly developed sense of individual responsibility.

As is usually the case, the greatest danger may lurk in apparently insignificant things. Many of us may remember from the days of our early youth the very small life size of how a battle was lost because a horseshoe nail turned up missing at the psychological moment. Now that the basic campaign for air transportation development has been worked out and is more or less in running order, it is time to be thinking about horseshoe nails. A little check of cables read in a reviewing shop yesterday, a control secured by strap when it should be free, or an instant invariable error on a propeller blade—of such are the horseshoe nails upon which the ultimate outcome of the battle may easily depend. Public confidence in aviation is at the fragile thing it once was, but it would not survive the impact of every trifling adventure apparently brought to pass by obviously careless practices.

Time-tables, servicing periods, maintenance schedules and what not may be established and enforced by mathematical formulae and by law, but in the final analysis success or failure rests solely with individuals. Everyone concerned, from the highest operating official down to the youngest baggage in the baggage, must realize that the lives of passengers and pilot, and so the chance of survival not only of his own company but of the entire air transportation scheme, are in his hands. He has a unique responsibility.

In air line operation one mistake is one too many. To deserve the continued increase of public confidence and public patronage we must constantly meet our extraordinarily difficult specifications. First, every individual must do his job PERFECTLY. Second, every individual must NEVER fail to keep his eyes open and his wits sharpened even beyond the strict bounds of his own responsibility. Anything short of that is a clear invitation to mishap.

## STATISTICS OF THE MONTH

Supplementing the statistical issue of AVIATION, March, 1933. Page numbers refer to that issue.

AIR TRANSPORT  
(Page 91)  
Estimated Domestic Operations  
First Eight Months 1933

Miles flown	1,000,000,000	30,000,000
Passenger-miles	1,000,000,000	100,000,000
Tons carried (est.)	100,000,000	10,000,000
Mail carried, domestic (est.)	10,000,000	1,000,000

Shows the progress of improved service and faster schedules, the acceptance of the airlines as a normal means of transportation much phenomenal gains during the summer of 1933. As shown in an accompanying chart, the passenger miles for August jumped from some 15,000,000 for 1932 to 22,000,000 in the same year. The effect of travel to and from the World Fair at Chicago is readily discernible in the tremendous increase which took place in June. It will be noted that airplane miles were not increased in the proportion shown by passenger miles. Obviously, the number of passengers per plane is increasing and the average passenger is making longer trips. The average for the first six months of the year was 137 miles per trip against the best previously recorded figure of 122 miles for the period July to December, 1932.

Preliminary figures for the month of September put passenger miles at the neighborhood of 23 million, airplane miles about 42 million. The annual totals are in evidence.

Elsewhere in this issue (page 363) will be found a detailed discussion of the character and growth of the express business. Another chart on this

page, however, shows the monthly totals for 1933 as compared with the figures for a year ago. Preliminary totals in about the 150,000 to level. Evidently the trend continues upward. Although the monthly percentage of air mail carried has shown a steady increase during 1933 back to the level attained during the first six months of 1932 (before increased postal rates of sorts crept into the volume), the current outlook is complicated by uncertainties at Washington and is not even demonstrating returns in operations per mile flown. In spite of reduced overhead, so far there have been few carloadings of services, and it is fairly that the figure of 10.35 per mile reached in September will show little, if any, decrease for the balance of the year. The sharp dip in rate for June, 1932, came about from the fact that more than eleven-eighths of the transportation for the first year had been used up during the preceding months, and the operators simply had to take what was left in payment for their June services. A similar dip occurred in June, 1933, but unfortunately there was no July recovery as in preceding years.

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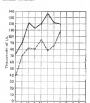


Shows Domestic Operations for the first five months.

How long the operators will continue to maintain service at the present levels is a matter for conjecture.

PRODUCTION AND EXPENSES  
(Page 91)

Two years of aircraft production in 1933 (as reflected in airplanes ordered or scheduled for the first time) followed the normal seasonal pattern much more closely than did the curve for 1932. Although the early part of the year was well below the 1932 level, the gains made during the spring opened through well into the summer as that it is likely that the total number of units produced this year will be very close to the 1932 figure. As in previous predictions, the curves of the accompanying charts are based on an average month of 31 weeks and include only the products of regular manufacturers, excluding the home builder and the maker of purely experimental aircraft.



Left: The sky will still be blue—business air, service down. Center: Airline passenger confidence is shaky. Right: Some gains noted for air express. (Circle date the curves continued to a further length would be available before making any conclusions.)





## FLYING EQUIPMENT

### New Equipment for Pan American

**S**UPPLEMENTING a program recently announced for the construction of six flying boats of considerably large size for transport development work, a contract has been let to the Fairchild Aviation Corporation for six single-engine, high-speed amphibians which are expected to yield performance in the range of modern land planes.

Practically every known device has been employed to reduce parasite and interference drag to a minimum. The hull has overhead lanes with smooth metal covering and a minimum of projections. All rivets are countersunk flush with surface. The nosecone flaps use all of the full cantilevered type well suited to the intersection with the hull. The single engine nacelle mounted over the center line will forward a nacelle of good aerodynamic form, complete with NACA cowling but is supported on a narrow frame-over built closely around the center line of the ship with all its members enclosed in a single streamlined housing well faired at top and base. There are no external trailing struts or wires of any kind.

The arrangement of the wheel-type landing gear is unique in that the main wheels and their supporting structures are retracted not into the hull as in the usual situation, but up into the underbelly of the wing just outward from the hull. The retract is accomplished by moving the upper end of the vertical strut (which carries wheel lock and shock strut) forward along the wing as well by means of a long wire-driven by an electric motor. Another retract feature is in the partial retraction of the wing by floats up against the lower surface of the wing when not in use, thus eliminating the parasite drag of the supporting strut and much of the interference of the float itself. The tail wheel is also retractable into the after portion of the hull.

The wings, tapered in thickness and in plan, are of the twin spar type. The interior structure and the covering are all riveted, with all exterior rivets countersunk flush with the skin. Free air intake is carried across the hull through a ball-balanced ramjet behind the pilot's seat, and over a flap through a ball-balanced flap which divides the intake into two parts. The ailerons are of the conventional type and recessed. Trailing edge flaps are set in three portions of the wing including the tip flap.

The tail surfaces are conventional, metal faired and metal covered. The fin is built as an integral part of the



Airline's choice of new Pan American Fairchild amphibian in flight

hull. The horizontal sections are supported by the fin (the stabilizer is faired rigidly to the hull) through a single strut on each side. Both rubber and steel are used in the forward section tube. Accommodations are provided for ten people, two pilots and eight passengers (maximum), the latter arranged four each in the two compartments. For convenience the passenger seats may be removed from the forward compartment thus making it available for cargo. Normally, entrance is gained to the cabin through a hatch in the port side part aft of the wing. Emergency exits are provided in the forward cabin compartment and above the pilot's seat.

Ahead of the cockpit is a 30 cu ft. space for miscellaneous stowage equipment and baggage. A headstave in the forward part of this compartment permits use of this crew as far forward as the forward or moving portions. An anchor locker in the extreme forward reaches through a small hatch in the deck.

Among the auxiliary equipment planned for these amphibians is a small oil-cooled marine engine which may be mounted on a collapsible bracket at the bow and operated from the anchor launch for maneuvering the plane on the water in restricted harbors, or for emergency use at sea.

The design contemplates the use of a Harnett 8400 engine supercharged to deliver 605 hp. at 2,000 r.p.m. up to 3,000 ft. Harnett standard compressible propeller will be used. With this power plant the ship is expected to show a best speed of 330 m.p.h. at sea level at an optimum cruising (at 45 percent horsepower) at 125 m.p.h. The

maximum speed without the flaps is to be 45 m.p.h., 35 m.p.h. with flaps down.

### Kinner Playboy Low Wing Monoplane

**T**HE first of a new series of Kinner low wing monoplanes for general sport purposes has recently been delivered to by Jim Bartholomew, a California pilot, who plans to make it a not only for pleasure but also for professional purposes.

The general details of the ship encompass city closely to those of recent high-speed sport. Its thin monoplaner wings are wire braced both to the upper longitudinal of the fuselage and to the undercarriage. The latter is of the diamond type with mainline wheel forks pivoted to scattered rigid wire struts. Wheel struts, and shock struts are fully adapted to absorb tremendous bumps.

The fuselage is a rectangular structure of welded chrome-nickel-molybdenum steel tubing, faired to an oval section and covered with fabric. The wing struts and landing gear supports are all of chrome-nickel-molybdenum steel built integral with the fuselage. The wing spars outward from the main are built up of spruce doublers with steel compression struts, wood ribs, the whole fabric-covered. Ailerons are of the tapered type incorporating Frisbee balance and operated by a differential control.

The tail unit is built of welded steel covered with fabric. Stabilizer and fin are fixed and are rigidly braced together with struts and wires. The elevators are provided with trimming tabs similar

to those in current use on transport power plant consists of one Kinner H-3 840 hp., five-cylinder radial engine on a detachable strut tube welded engine mount. Fifty-two gallons of fuel are provided for in two tanks, one in the fuselage (carried by gravity feed, and one located in the right wing stub. In addition to the 52 gal. of fuel, the ship is licensed to carry two persons and 125 lb. of baggage. It shows a top speed of 132 miles an hour and cruises at 125 in 4,000 ft. in the first minute at sea level and has an absolute ceiling of over 16,000 ft. Fuel supply is sufficient for a cruising radius of five hours. The general specifications are: span, 26 ft.; length overall, 34 ft. 2 in.; height, 7 ft. 6 in.; wing area, 145 sq. ft.; weight empty, 1,375 lb.; useful load, 800 lb.; gross weight, 2,175 lb.; wing loading, 15.27 lb. per sq. ft.; power loading, 13.56 lb. per hp.

### A Pair of Navy Fighters

**A**LTHOUGH the Boeing F4B-4 fighters have been in active service for some time, the specifications have



not been released. This daylight-high-performance fighter and light bomber was designed primarily for carrier use but a number of them are also in operation from land bases in the hands of Marine Corps pilots.

The fuselage is of monocoque construction, being built up of welded chrome-nickel-molybdenum steel tubing, metal covered forward of the front lower wing spar. Behind this point a semi-monocoque chrome-nickel-molybdenum structure is used. The steel tube engine mount is detachable. Wings consist of one upper panel and two lower panels interconnected by a single 30 strain system on each side. All struts and cable struts are of standard diameter tubing. Wings are built up of

spine flanges and monocoque plywood



New Kinner Playboy—single engine design selected by a Navy committee for the attack force. Landing design never gives all-weather service

welded box beams with wooden ribs and fabric covering. Ailerons are set on the upper wing panel for emergency folding gear. Tail surfaces are all-metal faired, covered with chrome-nickel-molybdenum alloy sheets. Provisions are made in the upper wing panel for emergency folding gear. Tail surfaces are all-metal faired, covered with chrome-nickel-molybdenum alloy sheets. Stabilizer is adjustable in flight.

Landing gear is of straight axle type equipped with shock absorbers and hydraulic brakes. Side locks are taken by a V-truss from the center of the axle

to the under part of the fuselage. The retractable tail wheel is also equipped with an oleo shock absorber.

The power plant consists of one 800 hp. Pratt & Whitney supercharged Wasp. A 25 gal. fuel tank is mounted in the fuselage and an auxiliary detachable tank also of 25 gal. is hung just aft of the landing gear. Seven gallons of oil are carried in a welded aluminum tank. The general specifications of the machine are: Span, 26 ft.; gross length, 35 ft. 4 in.; length overall, 28 ft. 5 in.; height, 9 ft. 9 in.; wing area, 127.9 sq. ft.; weight empty, 2,301.2 lb.; disposable load (as a bomber), 1,045.5 lb.; gross weight (as a fighter), 3,346.7 lb.; gross weight (as a bomber with five 16-lb. bombs), 3,557.5 lb.; wing loading, 13.25 lb. per sq. ft.; power loading (400 hp.), 6.03 lb. per hp.

Although firm details have been released, considerable experimental work has been completed on a new type twin-engine fighter for the Navy, the F7F-1. This machine is a biplane of more or less conventional lines except that the undercarriage is completely retractable in flight. It is powered with a Wright Cyclone and was designed by Grumman Aircraft, Inc., Farmingdale, N. Y.



Above (left): The Boeing F4B-4 fighter in service use by the U. S. Navy and the U. S. Marines. Above: The latest type twin-engine fighter for the U. S. Navy, the Grumman F7F-1.



## THE BUYERS' LOG BOOK

## AVIATION's Card Index of New Equipment

This department is designed to help readers locate manufacturers of any parts, accessories or materials

## AIRPORT EQUIPMENT

## Loader, tractor

Eckel-Strawson Road Machinery Company,  
Cleveland, Ohio

A SCOOTER-TYPE LOADER for handling snow, gravel, sand, loose dirt or other bulk materials about airports or highways is offered as its auxiliary attachment for Cleve-tractors. It will fit on either Standard or Jiffy-side models (20, 25, or 31) without drilling or skiving the machine. Hydraulic operation from single control lever. Capacity, 14-20 cu ft.

AVIATION, December, 1933

## GRAFTING EQUIPMENT

## Driving machine

Pitcher F. Milligan Company,  
6631 Proctor Avenue, Cleveland, Ohio

THE Weirgraph Desk Model, in the Junior size, is a portable driving machine which can be adapted to the needs of aerial navigation and surveying. Sensitive enough to fit into an ordinary brief case, it consists of a 4 in. x 6 in. Monocote board fitted with spring paper strip and a pantograph parallel rod device provided with adjustable scales, triangles and protractor. Movable pen or single slits.

AVIATION, December, 1933

## ENGINE ACCESSORIES

## Battery ignition

Schildt Magneto Company, Inc.,  
Sydney, N. Y.

IN ADDITION to the standard line of magnets for wire-wound engines put out by this company, American-made has been made of a new series of parts and equipment for battery ignition applicable either to existing engines or to be incorporated into new designs. All equipment for such purposes, including a new line of coil switches for single or multiple engine installations, is now available.

AVIATION, December, 1933

## ENGINE ACCESSORIES

## Exhaust manifolds

Solar Aircraft Company, Ltd.,  
Lansdowne Field, San Diego, Cal.

SPECIALIZING in the design of collector rings and exhaust manifolds, this company is in a position to furnish such equipment for all types of engine and installations. All manifolds are of stainless steel, welded. Special attention is given to problems of expansion, smooth gas flow, exhaust back pressure. Shops also equipped to handle other airplane parts in welded stainless steels.

AVIATION, December, 1933

## LABORATORY EQUIPMENT

## Stiffness tester

South-Tekco,  
1400 Townsend, N. Y.

THE Model E Stiffness Tester has been developed to determine the resistance to bending of all types of materials including sheet metals, wires and fabrics. Particularly adapted to the testing of extremely light papers which cannot be tested by methods by ordinary methods. Machines were made to 0.050 in., sheet metals to 0.000 in. Also adapted to plastic flow studies.

AVIATION, December, 1933

## LABORATORY EQUIPMENT

## Propeller blade balance

Telford Scale Company,  
Tulsa, Okla.

A NON-INDICATING BALANCE to give direct readings of longitudinal moment and out-of-balance on the inner ends of metal propeller blades, without reference to a master blade, now offered. Scales graduated to 0.1 in lb. on both ends. Adapter available to permit accommodation of all blade sizes. Claimed that blades may be balanced more accurately than by master system.

AVIATION, December, 1933

## SHOP EQUIPMENT

## Hot air blower

The Dwyer Electric Manufacturing Company,  
822 Blackhawk Street, Chicago, Ill.

THE Torpedo Hot Blower is designed for use with any source of compressed air to furnish a hot blast (500 deg. F. at the nozzle) to warm up oils and greases, thaw out frozen fuel or oil lines, or to dry out damp electrical apparatus. Blowing dust chemically. Flexible hose connection to current source. Equipped with Schneider valve. One lever controls both air and electricity.

AVIATION, December, 1933

## SHOP EQUIPMENT

## Air compressors

Dwyer Manufacturing Company,  
Tulsa, N. Y.

TWO new models of self contained compressed air units announced, one with small horizontal tank (16-6), and other with vertical tank (V-4) to save floor space. Two-cylinder compression driven by standard make electric motor through wet belt. Fitted with automatic pressure control, air filter, intake muffler, gas type fly-wheel. Horizontal and ground shafts mounted in large bearings.

AVIATION, December, 1933



The Severus Three Place Sport Amphibian in which Major Alexander F. de Seversky established a world's speed record for amphibious airplanes at Roosevelt Field, Long Island, on October 4, 1933. Major Seversky's average speed during this flight was 184.3 miles per hour. He used Kendall, the 30 Hour Oil, as lubricant for the motor.

DIMENSIONS	
Overall length	22 ft 6 in.
Overall width	14 ft 6 in.
Overall height	10 ft 6 in.
Wing span	22 ft 6 in.
Wing area	184 sq ft.
Wing loading	17.2 lbs. per sq. ft.
Wing chord	17 ft 6 in.
Wing thickness	4 in.

PERFORMANCE	
Top speed on land	211 mph.
Top speed in air	210 mph.
Service ceiling	14,000 ft.
Range on land	300 miles.
Range in air	300 miles.

**30-HR-33**  
Kendall's 30-Hour Oil  
New Performance in Aviation  
New Series, N. Y.

December 15, 1933

**Special Selling Points**  
Kendall's 30-Hour Oil

**Features:**

- 1. Made to improve engine performance and the Kendall Oil used in the Kendall Amphibian.
- 2. Used to speed up the engine.
- 3. Used to speed up the engine.
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- 6. Used to speed up the engine.
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Kendall's 30-Hour Oil

## Most RECORD-BREAKERS HAVE THE KENDALL HABIT!

IT isn't just an accident that so many record-breakers in aviation always use Kendall, the 30 Hour Oil, in their planes. It isn't by chance that men like Major Seversky, use to share world records, put Kendall Oil in their motors. There's a very good reason.

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"The tail of the Kingbird is extremely heavy... the shock that these tails received was terrific. Nothing stood up until we went to your Airwheels."

There's not much to add to that — except that Goodyear, with the Airwheel and Airwheel Hydraulic Disc Brake has solved the tough landing, taxiing and take-off problems for some of the largest air transport companies. It's a mighty good idea for you to know what this equipment can do for you. Why not write Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California?

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**GOODYEAR**

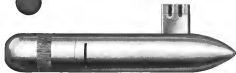
WHEN YOU BUY A NEW SHIP SPECIFY GOODYEAR AIRWHEELS

## PIONEER ROTATABLE AIR SPEED INDICATOR and ELECTRICALLY HEATED PITOT STATIC TUBE



ROTATABLE AIR SPEED INDICATOR Type 735 is an essential instrument, carefully designed to be quickly and easily read in conjunction with other instruments of the flight group. It is usually placed immediately to the left of the Turn Indicator, the Climb Indicator being placed on the opposite side.

The mechanism may be rotated so that when a predetermined air speed has been attained, the pointer assumes a horizontal position on the right hand side of the dial. The Rotatable Airspeed Indicator employs the same high grade mechanism used in all standard Pioneer instruments. Available ranges, 200 to 360 mph.



ELECTRICALLY HEATED PITOT STATIC TUBE, Type 357D

positively prevents ice formation at low temperatures, thus insuring operation of the Air Speed Indicator at all times. It is an established fact that within a certain low temperature range, ice will rapidly form on various parts of an airplane. The Pitot Static Tube, because of its small dimensions, may be rendered completely ineffective often before the airplane itself has been seriously affected by the ice load. Concurrently with this ice forming condition, low or zero visibility is usually encountered, making it necessary for the Pilot to depend entirely upon his instruments. The perfection of the Heated Pitot Static Tube makes possible reliable airspeed indication, regardless of temperature. To provide for various methods of mounting, Pitot Static Tubes, type 357D are offered in three models. All three models have the same Pitot Static section as illustrated above.

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PIONEER INSTRUMENT COMPANY INCORPORATED  
BROOKLYN - NEW YORK - A SUBSIDIARY OF THE BENDIS AVIATION CORPORATION

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The pitch of the Curtiss Controllable Pitch Propeller can be set at any angle by the pilot—from the lowest pitch for take-off and climb to full feathering for dead engine use on multi-engine transports. This arrangement is always desirable for improving performance, and it is essential in the following cases—(1) High speed transports—to give satisfactory take off and climb. (2) All classes of airplanes with supercharged engines—to give satisfactory take off plus speed and climb at all altitudes. (3) Multi-engine transports—to give satisfactory climb or necessary altitude when one engine has cut out.

*Approved by U. S. Department of Commerce*

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A three foot long immersion heater warms the incoming oil of the Doudle Airplane Engine 317—and G-E immersion heaters improve the engine power when it is in flight.

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October 25, 1933

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The President

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Please send me a copy of Bulletin GEA-5177C.

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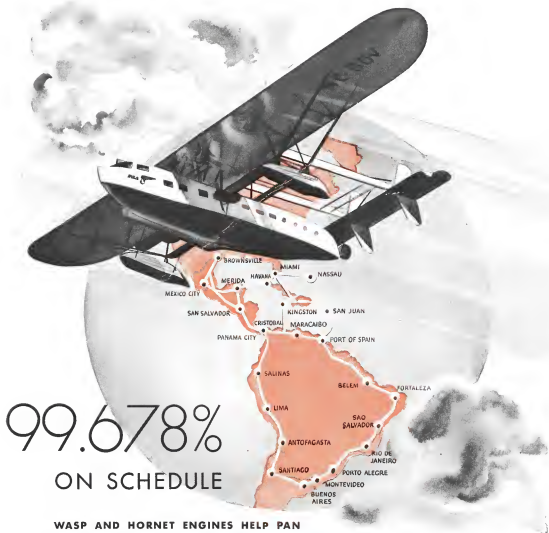
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